National Aeronautics and Space Administration

GSFC NEWS

tech transfer

Integrated Design Center

Yesterday's dream, today's concept, tomorrow's reality

VOLUME 10, NUMBER 2 | SPRING 2012

IN THIS ISSUE:

Integrated Design Center

Nona Cheeks

[FROM THE *Chief*

From the Chief

Planning and developing a space mission is an extremely complicated and involved process. The sooner the basic architecture is defined, the more quickly engineers and scientists can understand how all the sub-components work together. This in turn can help avoid unforeseen issues that can lead to additional costs and delays.

To help better define the requirements of a proposed mission, NASA Goddard has created the Integrated Design Center (IDC), the feature subject for this issue of *NASA Goddard Tech Transfer News*. The IDC brings together engineers from all discipline areas required for a mission, and provides a collaborative environment for a short (typically one week) and intense study session. Each study is an important tool for helping NASA Goddard define the parameters of an upcoming mission. This information can then be leveraged to help NASA Goddard build more complete and meaningful proposals -- and also help identify which missions may or may not be worthwhile for us to pursue. The IDC is also an excellent venue for vetting new technologies, either developed by NASA Goddard innovators or brought to our attention through our technology transfer network.

Since its creation in the late 1990's, the IDC has completed literally hundreds of studies. Many of these have been conducted on behalf of NASA Goddard. Other studies have been done for other NASA Centers, other government agencies, and in some cases private enterprise. The IDC's virtually unprecedented ability to bring together a broad spectrum of expertise into a single room and produce very rapid results can benefit many different types of research projects, both internal and external.

In addition, our legal experts Bryan Guerts (Chief Patent Counsel for NASA Goddard's Office of Patent Counsel) and Erika Arner (Partner for the law firm Finnegan, Henderson, Farabow, Garrett & Dunner) take a timely look at the proposed new U.S. Patent Office rules for implementing the America Invents Act (AIA). The AIA, passed last year in the U.S. House and Senate, represents some of the most sweeping changes to U.S. patent law in decades. Bryan and Erika explain how the proposed changes could affect inventors interested in patenting their intellectual property.

This issue also introduces a new regular feature, "SBIR/STTR Success Stories," which highlights technologies that have been developed with support from NASA Goddard's SBIR/STTR programs.

If you have any questions about partnering with NASA Goddard, or would like to learn more about NASA Goddard technologies in general, please feel free to contact the Innovative Partnerships Program Office at techtransfer@gsfc.nasa.gov.

Nona Cheeks
Chief, Innovative Partnerships Program Office (Code 504)
NASA Goddard Space Flight Center

NASA GODDARD *Integrated Design Center*

IDC Overview

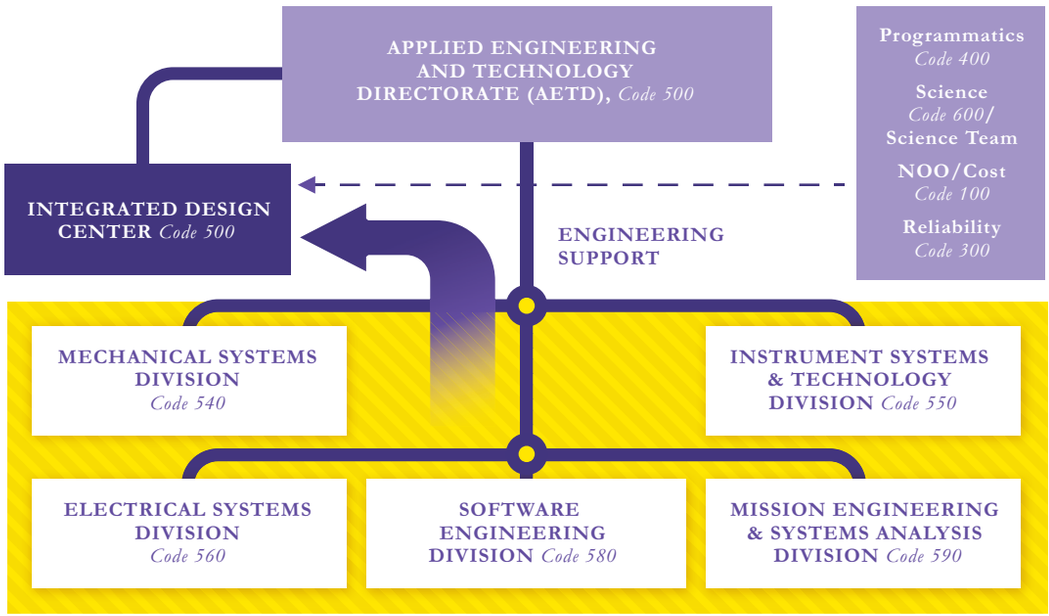
The Integrated Design Center (IDC) is a NASA Goddard facility whose purpose is to perform rapid concept design studies for future NASA missions. To do this, the IDC creates an environment for a short (typically one week) and intensive session that examines all major technical aspects of the proposed concept. By the end of each session, the client is presented with study materials that outline the feasibility of the concept under study, and a roadmap for how to make the concept a reality – materials that can then be leveraged multiple ways, such as the basis for a formal mission proposal.

This article presents a brief review of the IDC and its capabilities. We begin with a high-level overview of the IDC and the services it provides. We then look at the two primary components of the IDC, the Mission Design Lab (MDL) and the Instrument Design Lab (IDL). We conclude with a brief summary of the typical IDC deliverables for each project. *(For more information about the history and purpose of the IDC, see the interview with Dr. Bruce Campbell, IDC Manager, elsewhere in this issue of the NASA Goddard Tech Transfer News.)*

Integrated Design Center Overview

The engineers who conduct the studies comprise the most critical component of the IDC. The Divisions and Branches of NASA Goddard's Applied Engineering and Technology Directorate (AETD, Code 500) provide experienced and knowledgeable engineers in all disciplines needed for the particular study. The engineers apply their experience, as well as their familiarity with current and evolving technology in their areas, to quickly establish the best approach to meet the study requirements.

In addition, participants from other NASA Goddard Directorates contribute to the conceptual design in areas such as science (Code 600), reliability (Code 300), and cost estimating (Code 100). Finally, the members of the client team are an important part of the collaborative design process, providing continuous input and immediate feedback on the evolving design.



Integrated Design Center Engineering Participants.

The IDC Labs have dedicated Lab Leads and Systems Engineers who coordinate the study activities. They implement systems engineering processes within the concurrent and collaborative environment. These processes allow for rapid development, evaluation, and iteration of the concept design, with continuous interaction with the client team to ensure focus and progress toward the study objectives.

The IDC Labs provide engineering workstations for each discipline required to conduct the specific study. Each workstation is populated with the same engineering software tools that the engineer uses in actual spaceflight systems development; this provides credible engineering results and products useful for follow-on development activities. Workstations are physically arranged in a way that allows engineers to easily interact with each other and with members of the client team. Communications and display equipment allows all participants to keep abreast of the status of the evolving design, including those contributing remotely. In addition, the IDC internal and secure IT environment provides easy information gathering and sharing while ensuring that the study material remains secure.

Since 1997, the IDC Labs have conducted over 550 studies, mostly associated with Earth-orbiting NASA Goddard Earth and Space science missions. However, the IDC has also conducted studies for missions to the Moon, planets, comets, and asteroids; RF and laser communication satellites and systems; robotic and satellite servicing missions and systems; and Space Station and other human-related mission concepts. Studies range from short, broad architectural concepts to multi-week detailed concept developments, as well as focused technical reviews and assessments. In addition to NASA Goddard scientists, clients have included other NASA Centers and Headquarters, other government agencies and DoD, academic institutions, industry, and international partners.

The IDC provides NASA Goddard and AETD several important benefits. These include support for new business, technology infusion, visibility and outreach, cross-competency maintenance and enhancement, and cross-organization support and experience. These benefits may also be of significant interest and value to outside entities, including private business.

The IDC conducts these studies in two primary lab facilities, the Mission Design Lab and the Instrument Design Lab.

Mission Design Lab

The Mission Design Lab (MDL) provides conceptual end-to-end design and analysis for a wide variety of space mission concepts and architectures. Mission study capabilities include LEO, GEO, libration, retrograde, drift away, lunar, planetary, comet and asteroid, and deep space orbit destinations. Studies have been conducted for single spacecraft, constellations, formation flying, and distributed systems architectures. "End-to-end" mission analysis includes integration and test, launch and orbit establishment, operations (including ground operations), data collection and handling from the spacecraft to the scientist, and post-mission considerations including orbital debris requirements, controlled and un-controlled re-entry or orbital storage, and even servicing options.

Mission Design Lab.

—PHOTO BY NASA

Studies can develop initial end-to-end mission or architecture concepts; or examine, evaluate, and/or improve existing mission concepts or elements. Trade studies, risk analyses, independent assessments, and technology incorporation analyses can also be performed.

All standard spacecraft systems are examined, including mechanical/mechanisms, electrical/avionics, thermal, power, propulsion, attitude control, software, command and data handling, and communications. All mission elements, including launch vehicle, ground stations, operations and data centers are defined; and preliminary development and operations schedules are established. Sufficient fidelity is reached in all these aspects of the mission concept to allow preliminary cost estimates for the entire mission.

Instrument Design Lab

The Instrument Design Lab (IDL) provides conceptual end-to-end design and analysis for a wide variety of space mission instruments. All instrument families can be developed, such as telescopes, cameras, hyperspectral imagers, lidars and laser altimeters, spectrometers, coronographs, and others, These cover the full electromagnetic spectrum from microwave through gamma ray. The IDL also performs studies for in-situ instruments such as particles, fields, mass spectrometers, probes, and so on. "End-to-end" instrument design and analysis includes all instrument systems, including optics, detectors, structural/mechanical/mechanisms, electrical/electromechanical, data collection and handling to the spacecraft, thermal, power, software, integration and test, and operation modes and requirements including attitude control. Operational environments (radiation, thermal, planetary) for the mission orbit are examined and effects on systems design and reliability incorporated.

Studies can develop initial end-to-end instrument concepts, or examine, evaluate, and/or improve existing instrument concepts or elements. Trade studies, risk analyses, independent assessments, and technology incorporation analyses can also be performed.

Instrument Design Lab.

—PHOTO BY NASA

IDC Deliverables

When each IDC session is finished (generally at end-of-day Friday), the client receives a presentation addressing the main design points for the subject concept. This interactive presentation gives the client the opportunity to confirm that the resulting design meets their expectations and requirements. Among the areas typically covered by the final presentation are system/subsystem conceptual design, expected system performance, operational support requirements, operational scenarios, and others.

Study products include:

- PowerPoint presentations from each discipline describing systems concepts and characteristics.
- Top-level requirements definition and affect on systems designs, identification of challenges and risks, and ideas for future consideration.
- Engineering materials, such as CAD drawings, spreadsheets, models and other software outputs used in the development of the concept.

In addition, the client is provided with listings of supplemental or reference material. Approximately one to two weeks after study completion, the client also receives cost modeling and estimation data.

Takeaways

The NASA Goddard/AETD Integrated Design Center (IDC) provides rapid concept design studies for NASA Centers and other non-NASA entities. The IDC brings engineering expertise together with the client team into a single room, and during an intensive one-week session develops a conceptual design of the project. The IDC consists of two primary facilities: the Mission Design Lab (MDL), which provides conceptual design and analysis for space mission concepts and architectures; and the Instrument Design Lab (IDL), which offers conceptual design and analysis of instrument systems. Together these Labs provide a set of deliverables that the client can use as a guide for further development and research. These materials can also be leveraged into mission proposals.

Integrated Design Center

[INTERVIEW WITH *Dr. Bruce Campbell*

Interview

In this issue of *NASA Goddard Tech Transfer News*, we speak with Dr. Bruce Campbell (Code 500), Manager of the Integrated Design Center (IDC) at NASA's Goddard Space Flight Center. The IDC is NASA Goddard's "human and technology resource for providing rapid space system analysis and conceptual designs." Dr. Campbell provides his insight into the purpose of the IDC, its history, and how it can be used by NASA and others to help develop, validate, and integrate new technologies.

Q. *Briefly, what is the purpose of the Integrated Design Center?*

I like to say that anyone who needs a room full of engineers for any reason should come to the IDC. However, its main purpose is to support conceptual design of instruments and spacecraft/missions for NASA Goddard Space Flight Center. Because we have the capability, and provide such credible results, we can also provide this service to other NASA centers and outside organizations.

Q. *How does the IDC work?*

The key to the IDC's success is assembling the right combination of engineers, and getting them together with the "client" team in an environment that allows them to focus and work collaboratively toward developing a concept that meets the client's needs. Everyone is involved every step of the way. On Monday we can begin with a blank sheet of paper, and by the end of Friday we will come up with a credible conceptual engineering design that, after a cost estimate is conducted, could be leveraged into a formal proposal. The process is fun, fast, and very, very efficient. It really is amazing, and it's very interesting to be part of this process.

The personnel participating in each IDC session can be different from one study to another, though we do have a few "regulars." The people who serve as our engineering experts also have "normal" jobs outside the IDC; they work for us on an as-needed basis. Whenever a study pops up, we notify the AETD (Code 500) Branches and request support, and they provide us with whoever is available that has the knowledge and experience needed to do the kinds of studies we do in the Labs. Some may be working on different phases of an instrument or mission development that gives them time to support these studies periodically, while some may be between projects and might support several studies in a row. We even have a few Branch managers who participate occasionally.

I think this variety is good for the IDC, good for the clients and products we develop, and good for the individual engineers themselves.

Q. *How does a typical IDC project unfold?*

Once a session is scheduled, we'll ask the client to fill out a questionnaire ahead of time, so we can get some idea of what they are trying to do and what they want to get out of the study. We'll have a couple of meetings or telecons before the study to review this information and get ready to conduct the study.

For example, a client may approach us and say "I want to find black holes." This will require two major components; an instrument capable of detecting black holes, and a spacecraft mission that will allow the instrument to gather the desired information. For instance, if the scientist wants to use a gamma ray instrument for this application, we'll undertake to design such an instrument, with the proper

detectors, optics, and systems, and then "wrap a spacecraft around it," so to speak, to provide it with power, point it correctly, collect the instrument data, and transmit it back to Earth. We'll also figure out what orbit would be best, what launch vehicle could get you there, what ground stations would be required, and even how many people would be needed to operate it.

Each of these studies (instrument and mission) will generally be conducted over five days, Monday through Friday, with the engineers and clients working together continuously. The last day is used to present the results, with each engineer describing their systems and explaining how they came up with that design to meet the requirements.

When we're done, the client will have the basic plan for the black hole project, something with enough engineering credibility and definition that it will be a lot easier to "sell" when putting together a proposal requesting the mission. And as I mentioned earlier, besides the pre-study preparations and post-study wrap-up, all this takes place during a single five-day work week.

This sort of intense, focused approach to project design is pretty unique, with only a few other entities in the U.S. and elsewhere using this technique. Therefore the IDC could serve as a model to others outside NASA as a way to perform very thorough engineering design within a very limited timeframe.

Q. ***How did the IDC come to be?***

The IDC began as the Integrated Mission Design Center (IMDC) in 1997. Back in the late 1980's and early 1990's, NASA Goddard didn't really compete for a lot of its work. We had accumulated the largest concentration of Earth and Space scientists in the world; so whenever an Earth or Space science mission was approved, NASA Goddard was often assigned to implement it.

By the mid 1990's, NASA Centers had become more competitive, often bidding against each other when mission work came up. This meant that NASA Goddard now needed the capability to compete with other Centers. This led to the creation of the New Business Office in Code 100, whose purpose was to help NASA Goddard decide which work to go after, and to produce good proposals for that work. In the process, NASA Goddard realized that in order to put together a winning proposal, we needed to be able to perform conceptual engineering that could test the feasibility of each proposal and provide credibility of the design. This prompted the creation in the Engineering Directorate (Code 500) of the IMDC, and two years later the Instrument Synthesis and Analysis Lab (ISAL), to provide the same sort of capability to design NASA Goddard instruments. The IMDC and ISAL were soon combined under a single management structure, the IDC, and the names simplified to the Mission Design Lab (MDL) and the Instrument Design Lab (IDL).

Since then we've performed approximately 550 studies, averaging around 34 or so per year.

Q. ***Can the IDC assist new technology development?***

The IDC is the best and most logical place to incorporate new technology into future missions. This includes new developments in instrumentation, propulsion, spacecraft systems and others. The IDC is the ideal place to integrate these systems,

Dr. Bruce Campbell

Manager, Integrated Design Center

Code: 500

Years with NASA:
24 (NASA)
39 (Government)

Education:
B.S. Aerospace Engineering, US Naval Academy (flew Navy jets for a while)

M.S. Electrical/Space Systems Engineering, Naval Postgraduate School

Ph.D. Aerospace Engineering, George Washington University

Integrated Design Center in Action.

—PHOTO BY NASA

and demonstrate the benefits they may have on a particular mission or instrument concept. We can serve as a way to help determine the feasibility of incorporating or implementing the technology, and then illustrate what it would take to do so. This can help validate whether or not the new technology can be used practically.

The IDC can also help others figure out a validation methodology for their technologies. We have done many conceptual designs for validation missions. For example, we have done studies for previous New Millennium technologies such as solar sails and formation flying, as well as some studies for OCT [the Office of the Chief Technologist] for potential Technology Demonstration Missions.

Note that the IDC does not create new technology. Instead, we operate as a team of engineers trying to design a system that meets our clients' needs, using the latest and best technologies as appropriate.

Q. *Do IDC clients include non-Goddard projects?*

Most of the IDC studies come from NASA Goddard Bid & Proposal (B&P) and Institutional Research and Development (IRAD) activities working toward NASA Goddard interests. However we perform many studies for NASA Headquarters Program offices, assisting program development. We also do studies for other NASA Centers -- which in some cases may even be competing with NASA Goddard, but we keep their information secure. Of course, many of our studies include non-Goddard and non-NASA participants as part of the client team, including (periodically) Foreign Nationals. Clients include scientists from other institutions, or engineers from instrument or spacecraft development companies involved in the project development.

We have also conducted studies for other government agencies, such as NOAA and DoD, and have even performed studies for commercial companies. This requires Space Act agreements and such; but we had one fellow come in and ask whom he should make the $100,000 check out to! (Not to me, which is why I'm still here.) This is currently a small component of our overall work, although we'd like to see more of it.

I have even discussed potential work with foreign space agencies. There doesn't seem to be any NASA Goddard objections to doing so, other than ensuring no International Traffic in Arms (ITAR) infringements.

Q. *What are some of the other features and benefits of the IDC?*

The new Architecture Design Lab (ADL), which is in conceptual development itself, brings together highly experienced engineers with program managers and scientists who want to develop a basic approach or "architecture" for something with very little definition. In these studies we aren't going to the same level of engineering, relying more on engineering judgment and basic calculations to come up with the "big ideas." So we can do a lot of the "what ifs" and iterations we can't do in the usual conceptual design studies. These are very exciting and creative exercises, and we are getting more of these with time. Note this also helps define places within the architecture where new technologies are needed or could be introduced.

We can also look at the theoretical, things that are not yet technically possible at this time but may someday become so in the future. Some of these technologies may be years away, but we can still take a look at them and ideally develop a technology roadmap that may help them become reality. In the IDC, the sky is nowhere near the limit!

COMMERCIAL DEVELOPMENT *and the Integrated Design Center*

A Typical IDC Session. —PHOTO BY NASA

The NASA Goddard Integrated Design Center (IDC) was originally created to support NASA space missions and related technology development. Over the years, the IDC's "customer base" has grown to include non-NASA clients, including other government agencies (such as the Department of Defense and the National Oceanic and Atmospheric Administration), academia, and commercial companies.

According to Dr. Bruce Campbell, IDC Manager, commercial companies are frequently involved in IDC studies as part of the "client" team. These include spacecraft and/or space systems companies who have participated in IDC sessions primarily for technologies being developed in conjunction with NASA. However, a few IDC studies have been done directly for private companies. Although the commercial sector currently accounts for only a small fraction of IDC's overall work, it is an area that the Center would like to further develop and grow.

In this article, we examine some of the benefits the IDC can provide to commercial entities. We'll start with a quick review of IDC services, and how they might benefit commercial institutions. We then explain how you can request and schedule an IDC study for your own organization. [*For more details on the IDC's purpose, function, and history; consult the articles "The NASA Goddard Integrated Design Center (IDC)" and "Interview with Dr. Bruce Campbell" in this issue of NASA Goddard Tech Transfer News.*]

IDC Services

The IDC can provide services that can be of value to business in a variety of ways. For example, suppose your company is considering bidding on a major space systems or mission contract. The IDC can provide you with space systems engineering information that helps you define the scope and complexity of the

work, what technologies are involved, how much it will likely cost, and many other aspects of the project. You can then use this information to put together a realistic proposal for the work, one that helps ensure that this project can be completed on time and (hopefully) be profitable to you.

IDC sessions can also be useful in vetting new technologies. You can contract the IDC to examine whether or not a new space systems technology component you have recently identified will fit seamlessly into an existing system, and if so what advantages/disadvantages might result. In addition, IDC services can help with your long-term planning. For instance, you may have a concept for a future product, one that could present a breakthrough market opportunity for your business -- but will require the development of technologies that may not yet be available. The IDC can create a technology roadmap to guide the future development of your concept, and help make it a commercial reality.

The level of engineering analysis and design can be tailored to the phase of systems development. This includes short, broad architectural concept studies, to multi-week detailed engineering concept developments, as well as focused technical reviews and assessments. Studies and products can also focus on your needs for taking the next step in systems development (engineering reviews or reports for instance) and/or for marketing requirements from brochures to proposals – providing sufficient engineering to meet these needs, and appropriate associated products. Any situation that requires a room full of experienced, knowledgeable space systems engineers operating in an environment conducive to producing fast, focused, and credible results could benefit from coming to the IDC.

The IDC Process

The key to the IDC's success is assembling the right combination of engineers and getting them together with your team in an environment that allows them (and you) to focus and work collaboratively toward developing the products that meet your needs. All of the engineers who support the IDC are knowledgeable in their areas, and have the spaceflight experience to quickly identify solutions to the problems at hand.

To ensure that each project proceeds both smoothly and rapidly, the IDC requires all involved parties to be in the same location at the same time throughout the study. This ensures that the client is an active and engaged part of the IDC team. As engineers contribute their input and views, the Lab Lead constantly evaluates the client's needs and the Systems Engineer evaluates the evolving design toward meeting the system requirements. And as the design develops and evolves, the client provides real-time feedback, which the engineers consider and incorporate into their work. This helps ensure that the finished product is both thorough and relevant to the client's needs.

The process begins several months before the IDC study is scheduled. This involves pre-planning work for the session, including one or more meetings or teleconferences with the client. These discussions are intended to help define the goals, objectives, and scope of the upcoming IDC study. [*For a day-by-day description about how a typical IDC study proceeds, see the article "Integrated Design Center Case Study" in this issue of NASA Goddard Tech Transfer News.*]

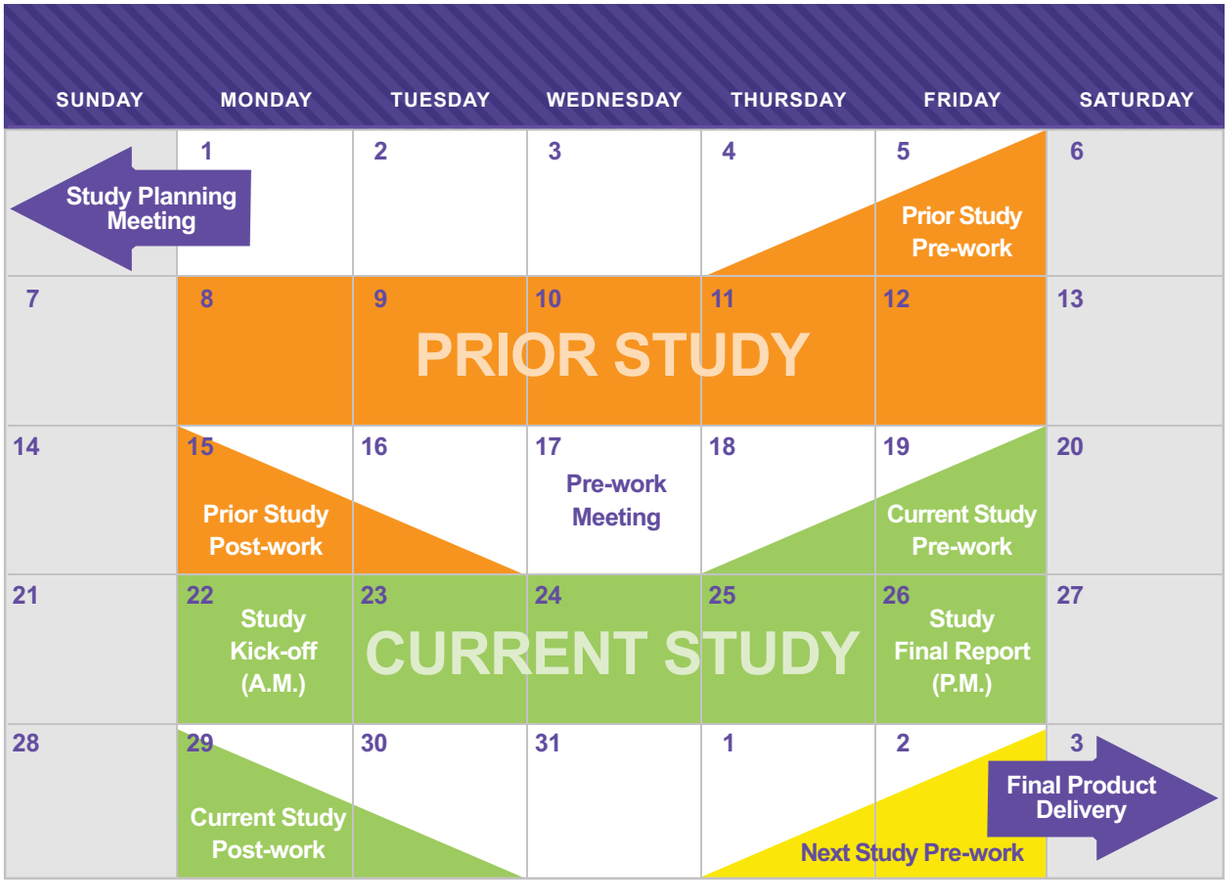
IDC Products

At the end of each IDC session, the client is given an interim presentation of the week's major findings. The interim presentation is then updated with the client's review comments and feedback, as well as the post-study cost estimates, and delivered in final form within one to two weeks following the completion of the IDC study. The final presentation is the major deliverable for the IDC session. In addition, other engineering products such as CAD drawings, spreadsheets, and model outputs are also provided. These materials are intended to serve the clients' immediate needs, as well as support future systems engineering development.

Requesting an IDC Study

If you're interested in scheduling an IDC study for one of your projects, the first step is to contact Dr. Bruce Campbell, IDC Manager. Dr. Campbell can be reached by phone at 301-286-9808, or through email at bruce.a.campbell@nasa.gov.

Dr. Campbell and his staff will help you define:
- How the IDC can best serve your needs.
- The type and scope of support you require.
- The time frame in which you need to complete the requested support.



Typical Schedule for an IDC Study.

Once your request is approved, the IDC staff will contact you to jointly define a study schedule. The schedule includes dates for pre-work meetings, the actual dates of your study, a date for a final presentation, and dates for post-work meetings (if required).

Note that the cost of an IDC session is highly variable, and depends largely on factors such as the scope and complexity of the proposed study. The cost of an IDC study must cover the nominal salaries of the Civil Servant (CS) personnel involved, as well as for any contractor engineers used in areas where CSs are not available. A "facility fee" is also charged to pay for IDC operational expenses, such as IT equipment and support. Historically, the total cost for resources needed for a typical one-week study averages around $100,000. IDC sessions can be funded from non-NASA sources. However, funding from outside sources may require Space Act Agreements or other official vehicles which may impact the lead time for the study, and therefore should be discussed directly with IDC personnel when scheduling a proposed session.

Takeaways

NASA Goddard's Integrated Design Center can provide significant value to non-NASA entities, including private enterprise. IDC studies can help companies prepare for proposals, vet technologies, and define technology roadmaps for long-term goals. To do this, the IDC offers facilities, processes, tools, and expertise from a wide variety of technical disciplines. Working together with the client, IDC engineers define and deliver products that can include basic design, functional diagrams, conclusions and recommendations, cost data, and other materials that the client can leverage for the further development and ultimate success of their products, technologies, and systems.

Case Study

As noted elsewhere in this issue of NASA Goddard *Tech Transfer News*, the Integrated Design Center (IDC) conducts studies that are both highly intensive and very short, with most studies completed within a single week or so. The deliverables for each study include a presentation that defines the technical requirements, feasibility, dependencies, and other aspects of the client's concept. This presentation can then be leveraged by the client in multiple ways.

This article presents a day-by-day review of how a typical IDC study may proceed. In this example, the project is undertaken by the Mission Design Lab (MDL), which along with the Instrument Design Lab (IDL) comprises the two main components of the IDC. Note that some aspects of an MDL study are similar to an IDL study, while other aspects can be significantly different.

We assume that the actual study requires one week within the MDL, with additional pre- and post-study work.

Planning Meeting

The first step in the process is the Planning Meeting with the client. This generally occurs a month or so before the study is scheduled to begin. To prepare for this meeting, the client is sent a questionnaire in which the client's goals, expectations, requirements, and other details are filled out. After the client returns the questionnaire to the MDL Lab Lead, a meeting (or teleconference for remote clients) is arranged.

The purpose of the Planning Meeting is to ensure that both the client and the MDL/IDC leadership team have a mutual understanding of the major parameters and expectations for the study, and that the study can reasonably be conducted within the available time and resources. This includes primary objectives, ground rules, sensitive issues, and any other information useful for planning and executing the study. A critical goal of this meeting is for the IDC team to begin to understand what the customer needs (which in some situations may not necessarily be what they think they need, depending on the next step in mission development). The client is also informed about the day-by-day schedule, deliverables, and other particulars about the upcoming study. This meeting helps identify the staffing plan, which includes the engineering expertise, tools, and other requirements that need to be on hand during the study to ensure a successful outcome.

The week before the study begins, the full MDL team conducts a Pre-Work Meeting in which they review the results of the Planning Meeting with the customer team, along with any supplemental information provided by the client. After this meeting, the MDL team can start developing a list of key study issues and trades, as well as a "plan of attack" for the study.

Monday: Kicking Off the Study

On Monday morning, the MDL team kicks off the study by discussing key high-level technical requirements with the client. This allows the MDL engineers to begin discussing the approaches they will take to define the concept. The level of detail expected in the final study report is also defined at this time. In the afternoon, the team defines the concepts of operations (ConOps) which describes how the mission will be conducted and defines systems operational requirements. This session also begins the process of defining the subsystem configuration for the client's concept.

Tuesday: Defining Tagups

The Tuesday session is devoted to defining "tagups." This process involves identifying areas requiring additional discussions between engineers and the client team, or requiring multi-discipline discussions to ensure systems compatibility. This also includes putting together a block diagram that fully describes the system, and an associated product checklist. The goal at the end of the second day is to have a firm understanding all the components that will be required for the client's concept, their requirements, and how they will work together.

▶ *Engineers Discussing a Proposed Mission Design.*

—PHOTO BY NASA

Wednesday: Finalizing the Design

After the completion of Tuesday's sessions, the subsystems for the client's concept should be fairly well understood. The purpose of Wednesday's session is to review how these subsystems will fit together into a final high-level design, and to work on any areas that require modification for a better fit. This requires close collaboration between all engineering groups participating in the study, and with client representatives. By the end of Wednesday's activities, the major characteristics of the mission's elements (mass, power, data, size, and so on as applicable) should be defined, allowing top-level evaluation of the concept.

Thursday: Internal Consistency Check

Day 4 of a typical MDL study is devoted to working any areas needed to finalize a "closed" design that meets the clients' requirements, and to preparing the presentation to be delivered to the client and ensuring it is complete and delivers a clean, consistent message. The presentation includes contributions from each engineering discipline participating in the study. For ease of understanding, all these sections follow a common format.

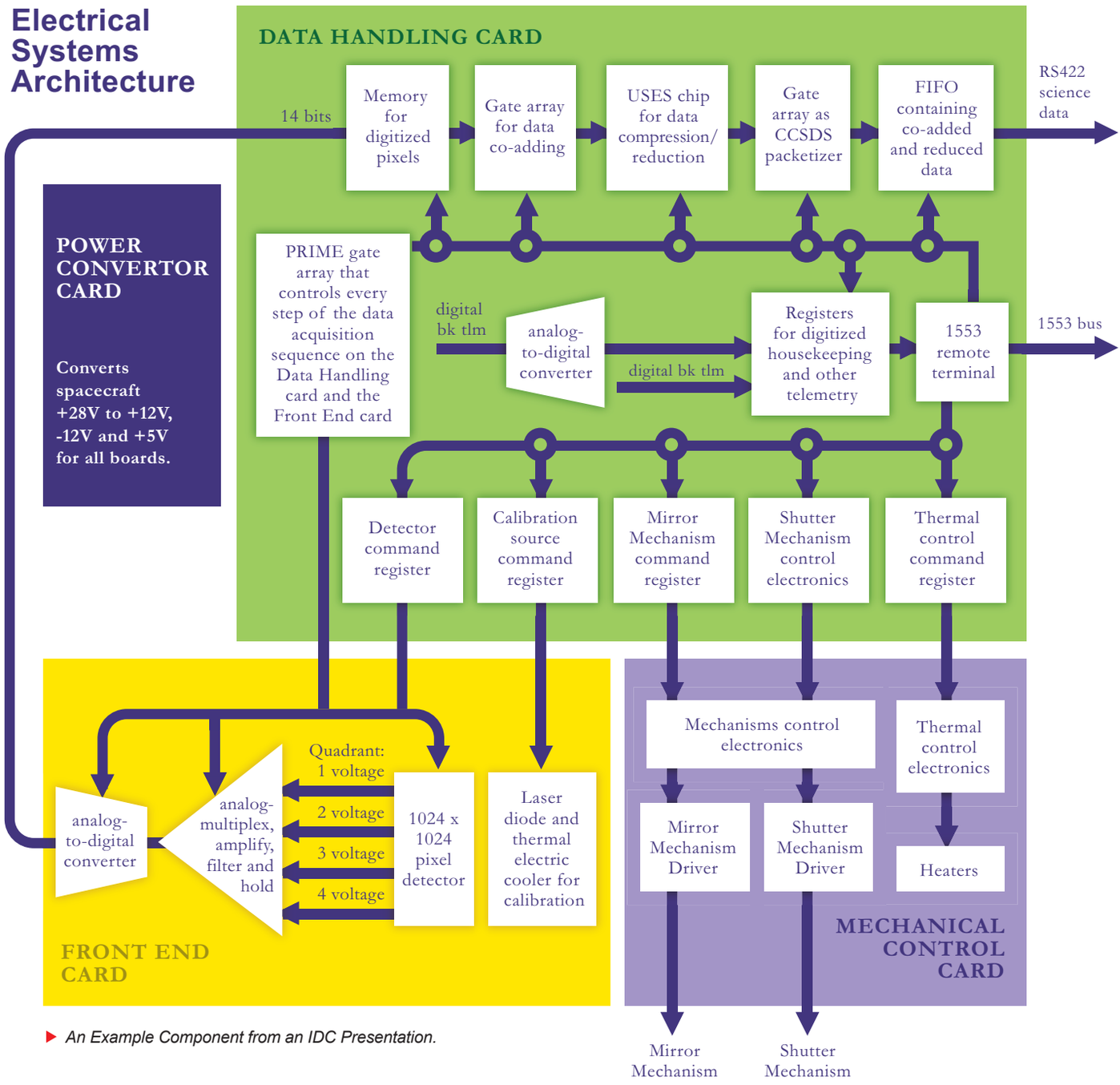
MDL engineers review and comment upon each section of the presentation, with updates, suggestions, and corrections incorporated into the materials as appropriate. The client may or may not be present during this review, depending on the study. During this process, the MDL engineer reviewers also attempt to anticipate any questions the client may have, and update the presentations accordingly. When each section of the presentation has been reviewed and internally approved, it will be ready to be presented to the client.

Friday: Presenting to the Client

At the end of the week, the finalized study report is presented to the client. The primary purpose of this presentation is to deliver an outline of the main design points required for the client's concept to become a reality. Depending on the client's requirements and the nature of the concept under study, the presentation may include:

- System/subsystem high-level configuration
- Feasibility studies
- Support requirements and dependencies
- System performance parameters
- Technology roadmaps
- Identification of unresolved issues and potential risks
- Recommendations for future work

After the conclusion of the study week, the client reviews the presentation and gets back to the MDL team with any comments, questions, or other feedback. The client's input is then incorporated into the final presentation, along with any internally identified corrections or additions to the material. Additional data, such as cost modeling, is usually



An Example Component from an IDC Presentation.

developed and added to the deliverables one to two weeks after the completion of the study. The updated report is then delivered to the client on CD-ROM.

Takeaways

A typical NASA Goddard Integrated Design Center study requires one week of intense on-site work to complete. Studies usually begin with the client filling out a questionnaire, and then attending pre-study meetings with IDC personnel to synchronize expectations and requirements. The study week begins with defining the concept and its subsystems, and then developing a high-level engineering design that accommodates the study requirements. The latter part of the study week is devoted to writing the study presentation and then presenting it to the client. This presentation is subsequently updated post-study with the client's review comments along with cost estimates and other engineering materials, and delivered in final form a week or two after the study is complete.

[SBIR *Success Story*

SBIR Success Story

This issue of NASA Goddard *Tech Transfer News* initiates a new regular feature, "SBIR/STTR Success Stories." This article kicks off the series with a brief explanation of the SBIR and STTR programs. We then look at a recent SBIR success story involving QmagiQ and their novel infrared camera technology.

The Small Business Innovation Research (SBIR) Program is a U.S. Federal Government-sponsored initiative that provides funding for small businesses to help develop their inventions into commercial products and services. According to the SBIR program web site (http://www.sbir.gov/about/about-sbir), the four primary goals are to:

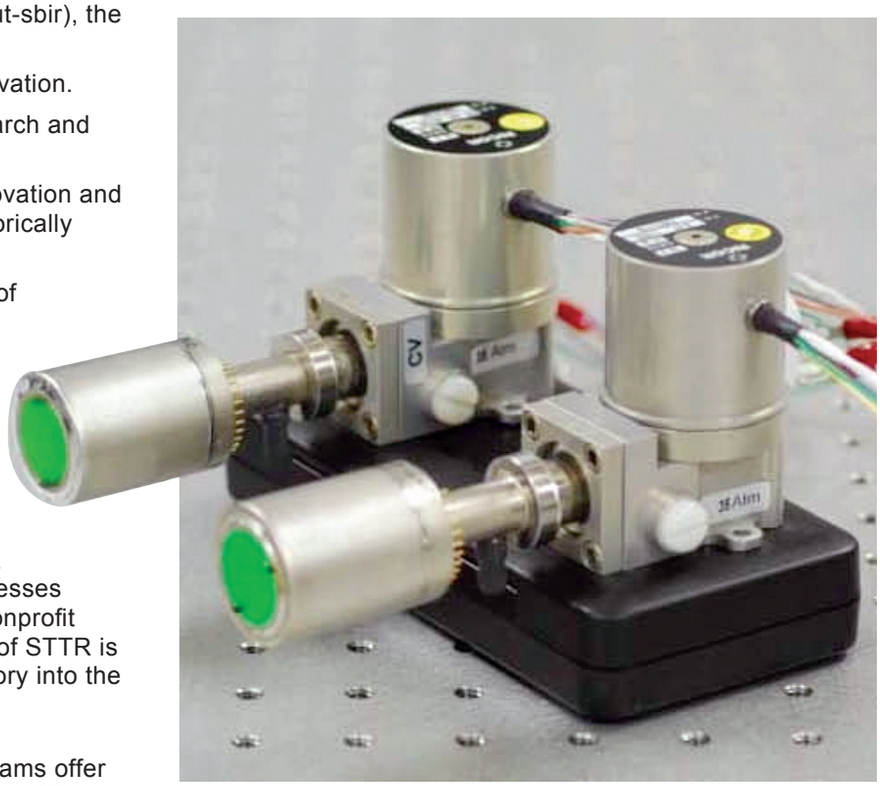
- Stimulate technological innovation.
- Meet U.S. government research and development needs.
- Promote participation in innovation and entrepreneurship within historically disadvantaged communities.
- Increase commercialization of innovations derived from governmental R&D funding.

The Small Business Technology Transfer (STTR) program is similar to the SBIR program. The primary difference is that STTR involves funding of small businesses working in collaboration with nonprofit research institutions. The goal of STTR is to move ideas from the laboratory into the commercial marketplace.

Both the SBIR and STTR programs offer three phases of awards; winners of Phase I awards can apply for Phase II awards, and Phase II awardees can apply for Phase III awards.

NASA maintains an active SBIR/STTR program that operates across NASA Centers. A feature of NASA's program is the fact that these awards take the form of a contract between NASA and the small business. When the work contract is completed, NASA's partner retains the rights to the IP developed through the contract.

For more information about NASA's SBIR/STTR program, including how to submit a proposal in response to a solicitation, see http://sbir.gsfc.nasa.gov/SBIR/SBIR.html.



QWIP Sensor Cartridges.

—PHOTO BY NASA

Camera With Pluggable Cartridge Interface.
—PHOTO BY NASA

μm pitch) for mid-wavelength (4-5 μm) and long-wavelength (10-11 μm) imaging. The company has also developed a camera with a pluggable interface for the QWIP sensor cartridges.

The camera has been used at NASA Goddard for field investigations, such as locating caves in a desert landscape from an aerial platform. In addition, QmaqiQ is currently building cameras for the Missile Defense Agency that will be used for the evaluation of new photodetectors.

Potential commercial applications for this technology include chemical/spectral mapping of forests, vegetation, crops, and landmasses; pollution monitoring; temperature mapping; and atmospheric sensing.

QmagiQ, founded September 2003, develops strained layer super lattice (SLS) and quantum well infrared photo detector (QWIP) focal plane arrays (FPAs). Product lines include mid-format 1-color long wave infrared (LWIR), large-format 1-color LWIR, and mid-format 2-color midwave/long wave infrared (MWIR/LWIR).

Potential commercial applications for this technology include chemical/spectral mapping of forests, vegetation, crops, and landmasses; pollution monitoring; temperature mapping; and atmospheric sensing.

Portable Infrared Camera

One NASA Goddard SBIR award that has resulted in a commercial product is a compact portable infrared camera with interchangeable quantum well Infrared photodectors sensor cartridges, developed by QmagiQ of Nashua, NH. Under the SBIR contract originally awarded in 2006, QmagiQ developed two QWIP focal plane arrays (320x256 format, 30

The Infrared Detection Market

The SBIR contract awarded to QmagiQ could help better establish their technology within a very promising market. Infrared detectors are used in a wide variety of applications. According to Frost & Sullivan, applications for infrared detectors include gas, humidity, optical, and temperature detection. Frost & Sullivan estimates that in the U.S. these and other infrared sensor applications collectively comprise a billion-dollar market.

According to QmagiQ's web site, "The infrared camera/system market requires a reliable supplier of high-performance cost-competitive LWIR FPAs. QmagiQ is and will continue to be that supplier. There is also an ongoing market need for sensors that will cut system costs and offer significant new capabilities (e.g. uncooled operation, multi-color/hyperspectral imaging, imaging and detection from near-IR to terahertz bands, etc.) to penetrate new markets and enable new applications. QmagiQ is aggressively developing solutions to these needs - our next-generation sensors will be one of the engines driving IR market growth."

PROPOSED CHANGES TO *U.S. Patent Office Rules*

In 2011, the U.S. House and Senate passed the America Invents Act (AIA), calling for sweeping changes to this country's patent laws. (See also the Spring 2011 edition of NASA Goddard *Tech Transfer News*.) Since the passage of the Act, the U.S. Patent Office has begun to implement revised rules to accommodate the new patenting provisions. Some of these rules have already been put in place, while others have been proposed and are scheduled to take effect in the near future.

This installment of Patenting Perspectives examines the proposed changes to the U.S. Patent Office rules, and what they may mean for inventors. As usual, offering their perspectives on this topic are attorneys Bryan Geurts (Chief Patent Counsel for NASA Goddard's Office of Patent Counsel) and Erika Arner (Partner for the law firm Finnegan, Henderson, Farabow, Garrett & Dunner).

Q. *How significant are the proposed changes to the U.S. Patent Office rules?*

Bryan: The proposed changes are big, with perhaps 20 or so substantive provisions. They comprise quite a laundry list, one that will no doubt change the way we practice patent law.

Bryan Geurts

Erika: Some of these rules have already been implemented. Another large chunk of these rules will take effect on September 16, 2012, one year after AIA was passed. For those changes, the Patent Office has put the proposed changes out there for review, and has received a lot of feedback. The final rules are scheduled to be announced in August. Perhaps the most significant change is first-to-file, which will take effect in March 2013. The Patent Office plans to issue proposed rules for implementing first-to-file later this year.

Bryan: As a rule of thumb, the more time goes by, the more profound the changes. The first batch of rules that have already been enacted were relatively smaller; while upcoming ones, such as first-to-file, have much higher stakes.

Q. *Have any changes that are already implemented made an impact?*

Erika: One rule that was put in effect last September has already become a very useful tool. Basically, if you're willing to pay a $5000 fee, the Patent Office will accelerate the examination process for your patent application and resolve it one way or another within a calendar year. This has resulted in some very fast examinations, much quicker than I was expecting. In fact, several patents have already been awarded under this process -- in under six months start to finish, which is pretty remarkable. It's a relatively small change, but it's resulted in a big improvement.

I think a lot of people will take advantage of this process in the future. Because of the relatively steep fee, this option may not be for everyone. But if you're in a position where there's more value in getting your patent as quickly as possible, this is the way to go. I can see people using it for inventions they consider especially important.

Bryan: NASA has already pushed through two or three patents under this new process.

Q. *Are any of the proposed changes especially controversial?*

Bryan: The biggest controversy was over the passage of AIA itself. What's happening now is more or less just the implementation of the provisions of AIA. So far I must admit to being pleasantly surprised; for the most part I'm happy with these proposed changes.

Erika: There is some controversy around the proposed implementation of some of the rules. As a result, some proposed rules are being re-written due to public objections concerning whether or not they are true to the spirit of AIA.

Erika Arner

For the most part, the Patent Office is staying responsive to feedback it receives. For example, AIA allows a company to apply for a patent and delay filing paperwork signed by the individual inventors. To put this change in practice, the Patent Office created a rule that imposed a high fee when a company did this. There was an outcry from businesses who saw this fee as essentially a penalty. In response, the Patent Office agreed to resubmit this rule. So far they've been good at taking public opinion into account.

Still, not everyone is happy with all the new rules. For instance, some Patent Office fees are now much higher than previous ones, literally orders of magnitude higher. There's been strong resistance to these fees, and they still remain a hot button issue.

Bryan: Fees are always a hot button issue. Some proposed fees do seem exorbitant, 50% higher or even more compared to previous levels.

Q. *What are some of the other ways these rules could impact innovators?*

Bryan: There's now a new class of inventor called a "Microentity." This allows a first-time or junior inventor to take part in the patenting system at a reduced cost. Also, there is an incentive to file patent applications electronically.

Erika: First-to-file will have a big effect, especially for those with limited resources. The need to file quickly will now be more urgent.

Bryan: This in turn could cause significant concern under Bayh-Dole, which allows a two-year window in which a small business or non-profit partner working under a government contract or grant can elect title to develop inventions. If during this window the partner is taking its time deciding whether or not to patent an invention, and someone else comes along and patents a similar technology, the government loses out on potentially valuable intellectual property. The government needs to know earlier, i.e. in time to perfect its rights, whether the partner will elect title. Bayh-Dole may need to be modified to accommodate this concern.

Q. *What is the current status of these proposed changes?*

Erika: There's still quite a bit to figure out between now and when the next round of final rules is released in August. The Patent Office says they are being responsive to feedback, although we won't know for sure until we see the final rules.

Bryan: This is a precarious time in the process. Some of the new rules scheduled to take effect in September involve contested cases, and how interested parties will behave towards each other. It will be interesting to see how these rules evolve; because I'm not convinced the process will be smooth.

Erika: One challenge will be the fact that many companies will have patents under both regimes. Up until March 16, 2013 U.S. patents will still be under first-to-invent. Some of these patents could be extended using continuation applications extensions, which may take decades to play out. So for a period it will be challenging to determine whether first-to-invent or first-to-file applies for a specific patent application.

Q. *Can interested parties still provide feedback on these proposed changes?*

Erika: One can still send comments to the Patent Office via email, or through their web site [see http://www.uspto.gov/ip/rules/index.jsp]. The Patent Office has also been proactively seeking comment, by presenting at various conventions and through webcasts.

Bryan: They've also been using social media, blogs, and FAQ's. They've certainly done a good job of getting the word out and press control, for which I give them credit.

Bryan Geurts

CHIEF PATENT COUNSEL

Code: 140.1

Years with NASA: 11

Education:

B.S. - Civil Engineering, B.A. German from University of Utah

Juris Doctor Degree from Brigham Young University

NASA OPTIMUS PRIME Spinoff Awards

(APRIL 12, 2012, CAPE CANAVERAL, FL)

The NASA OPTIMUS PRIME Spinoff Awards ceremony was held April 12 at NASA Kennedy Space Center. The contest is run by NASA Goddard's Innovative Partnerships Program Office (IPPO) with the goal to raise student awareness of how NASA technologies provide benefits to the public. A second goal is to show the similarities with the popular OPTIMUS PRIME character from Hasbro's Transformers. Students nationwide in grades 3 through 12 participated in this year's contest.

The ceremony included managers from NASA and Hasbro, the winning students, and associated NASA innovators and their commercial partners. A special guest was actor Peter Cullen, the voice of OPTIMUS PRIME in the highly successful Transformers movies.

The NASA OPTIMUS PRIME Award is intended to help students recognize some of the many NASA space-related inventions that have found their way into everyday life and benefitted the public. Partners for this event included Hasbro, Rocket 21, ASME, the U.S. Patent Office, and Solar Protective Fabric.

▶ *Goddard's Innovative Partnerships Program Office (IPPO) Senior Technology Manager Darryl Mitchell addresses parents, students, and teachers in the Rocket Garden of the Kennedy Space Center Visitors Complex.*

▶ *Space shuttle astronauts Wendy Lawrence and Jon McBride speak about the importance of education during the 2012 NASA OPTIMUS PRIME Spinoff Awards Ceremony in the Rocket Garden of the Kennedy Space Center Visitors Complex.*

—PHOTOS BY NASA

Participants in the NASA OPTIMUS PRIME program create videos highlighting how a particular NASA invention has been "spun off" as a product that can now be used by the public. This continues a long tradition of NASA inventions and research, originally intended for space missions, being made into products for everyday life. These include important breakthroughs in computers, medical science, communications, photography, and advanced materials.

Speakers for the event included astronauts Wendy Lawrence and John McBride. Also presenting was NASA Project Scientist Dr. Amber Straughn, who spoke about the James Webb Space Telescope, the successor to the famous Hubble Space Telescope.

2012 Federal Laboratory Consortium National Meeting

(APRIL 30 – MAY 3, 2012, PITTSBURGH, PA)

The Federal Laboratory Consortium for Technology Transfer (FLC) is a nationwide network of federal laboratories that provides a forum to develop strategies and opportunities for linking laboratory mission technologies and expertise with the marketplace. The FLC National Meeting was held in Pittsburgh, Pennsylvania on April 30, 2012 through May 3, 2012. The theme for this year's meeting was "Bridging Federal Technologies and Industry." One focus of the meeting was bridging the gap between federal laboratories and the commercial marketplace in Pittsburgh. NASA Goddard's Innovative Partnerships Program Office (IPPO), along with other federal labs, was on hand seeking to formulate partnerships and collaborations with industries in Pittsburgh. The meeting also included training sessions, daily keynote speakers and panel discussions on a variety of topics. The meeting concluded with the FLC Awards honoring outstanding efforts in technology transfer.

Space Propulsion 2012 Conference

(MAY 7 – 12, 2012, BORDEAUX, FRANCE)

The Space Propulsion 2012 Conference was held May 7 through 12 in Bordeaux, France. In attendance were NASA Goddard representatives who led and participated in panel discussions, gave presentations, and oversaw the NASA exhibit. NASA Goddard personnel also took part in meetings with current and potential partners within NASA and industry.

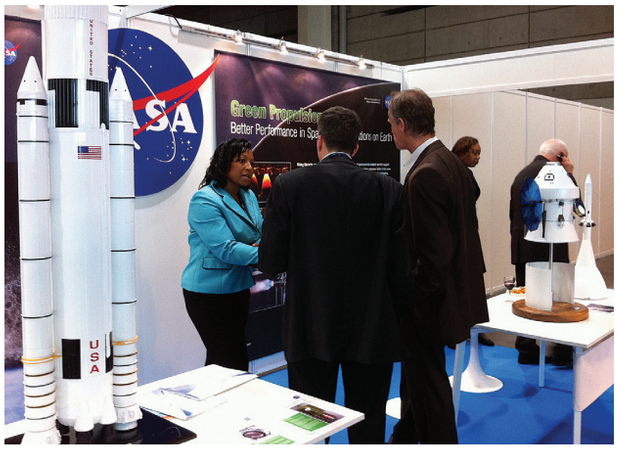
NASA Goddard's primary goals in attending were to learn more about new propellants and propellant systems for space, share ideas about applying current and new propellants to in-space propulsion for near and far term requirements, and encourage interest in collaborating with NASA Goddard to advance the state-of-the-art of propulsion technologies. An additional goal was to further promote the licensing of NASA Goddard component technologies that support space propulsion systems.

The Conference's plenary and breakout sessions were focused on understanding regulations and priorities pertaining to various new propulsion materials and subsequent technologies. As a result, discussions during and following the sessions focused on the best strategies going forward for adapting a broader array of propellants in respective space programs.

Key areas of specific interest to NASA Goddard included:

- Propellants for on-orbit missions.
- Utilization of corresponding hardware systems.
- Structuring government and industry partnerships for technology demonstration to validate new materials.
- Other mechanisms to determine performance requirements for new propulsion materials.

During the conference, the Innovative Partnerships Program Office (IPPO) marketed NASA Goddard intellectual property for component technologies (such as a nitinol valve, GSC-16336-1) for licensing and further development via partnering. This resulted in prospective licenses and possibly new agreements with several industry organizations that are currently being managed by NASA IPPO.



Deputy Center Director for Science & Technology Christyl Johnson speaks with attendees at the NASA booth.

—PHOTO BY NASA

Conference on Lasers and Electro-Optics (CLEO)

(MAY 9 – 11, 2012, SAN JOSE, CA)

Innovative Partnerships Program Office (IPPO) Technology Manager, Enidia Santiago-Arce, presented at CLEO 2012's Tutorial: Technology Transfer 101: Technology Licensing and Tech Startups session. During this presentation Ms. Santiago-Arce described partnering and licensing processes and mechanisms, and shared some of NASA's successful partnering stories. The Innovative Partnerships Program Office helps leverage NASA developed technologies to form mutually beneficial partnerships with entities such as other NASA centers, other government agencies, private enterprises, universities and others.

2012 Nebula Awards Weekend

(MAY 17 – 20, 2012, ARLINGTON, VA)

The 47th annual Nebula Awards Weekend was held Thursday, May 17 through Sunday, May 20, 2012 at the Hyatt Regency Crystal City in Arlington, VA. These awards, presented by the Science Fiction and Fantasy Writers of America (SFWA), recognize the year's best novel, novella, novelette, short story, and script in the science fiction and fantasy genres. The event was attended by many writers and editors, and included meetings and panel discussions, followed by a banquet on the evening of May 19. The SFWA, founded in 1965, currently has over 1,500 members representing many of the leading writers of science fiction and fantasy.

The 2012 Nebula Awards Weekend included an exhibit presented by the NASA Goddard Space Flight Center. The exhibit offered attendees the opportunity to meet NASA personnel, and also provided souvenir space photographs for visitors. In addition, NASA Goddard hosted two panel sessions. The first was "The Potential for Life Beyond Earth: Exoplanets and Astrobiology." In this panel, NASA scientists who study exoplanets, life in extreme conditions, and complex molecules in the solar system discussed the current state of research and what discoveries might be coming in the near future. The second panel was "Exploring the Earth -- From Above." This featured a discussion of NASA's latest scientific developments in areas such as climate change and space weather.

NASA's presence at the Nebula Awards event was part of the Agency's ongoing campaign to emphasize the historically strong affinity and synergy between the science research and science fiction communities. Many people currently involved in science and technology credit science fiction as a significant early inspiration for their career choices. In this way, the continued high popularity of science fiction literature, films, and games can serve as an important gateway to the general public.

Science Jamboree

(JUNE 5, 2012, GREENBELT, MD)

The NASA Goddard Innovative Partnerships Program Office (IPPO) hosted a table during this year's annual Science Jamboree taking place on June 5, in the building 28 atrium. The IPPO distributed information on partnering with NASA as well as literature on NASA's SBIR/STTR program. The Science Jamboree gives Goddard's top scientists and engineers the opportunity to showcase their work to the thousands of people who work at Goddard. This year's jamboree emphasized Earth Science, Heliophysics, and space weather and occurred in conjunction with "Sun-Earth Day" which was held to celebrate the transit of Venus.

Attendees visit the Innovative Partnerships Program Office (IPPO) tables at the 2012 Science Jamboree.

—PHOTO BY NASA

2012 Celebrate Goddard Day

(JUNE 28, 2012, GREENBELT, MD)

NASA Goddard Space Flight Center's Innovative Partnerships Program Office (IPPO) was part of the Applied Engineering and Technology Directorate's (AETD) exhibit during Celebrate Goddard Day on June 28, 2012. Celebrate Goddard Day allows Goddard personnel and interns the opportunity to get acquainted with many of the different aspects of Goddard while touring the center and taking part in various activities and games. The IPPO display provided attendees with information on NASA spinoffs, technology development and information on partnering with NASA Goddard. The booth also hosted a prize wheel giving visitors a chance to have their photo taken as a memento.

Innovative Partnerships Program Office (IPPO) Technology Manager Dennis Small talks with visitors during Celebrate Goddard Day 2012.

—PHOTO BY NASA

NTRs and Patents

NTRs

- **COMPARISON TOOL FOR JAVA ARCHIVE FILES AND JAVA CLASS FILES**

  Andrew Spina

- **A NOVEL LENSLET COUPLED PINHOLE MASK TO SUPPRESS STARLIGHT FOR HIGH CONTRAST IMAGING**

  Qian Gong, Michael McElwain

- **SOFTWARE FOR EXECUTING CCSDS 121B STANDARDS ON "LOSSLESS DATA COMPRESSION"**

  Penshu Yeh

- **AUTOMATED ENCLOSED GATE TRANSISTOR LAYOUT CELLS FOR RADIATION TOLERANT ASIC DESIGN**

  Jeffrey DuMonthier

- **NEW RHBO ELECTRONICS**

  Gary Maki, Sterling Whitaker

- **SOFTWARE FOR EXECUTING INTERNATIONAL STANDARD CCSDS 123B ON "LOSSLESS MULTISPECTRAL & HYPERSPECTRAL IMAGE COMPRESSION"**

  Penshu Yeh

- **MIRRORLET ARRAY FOR INTEGRAL FIELD SPECTROMETERS (IFS)**

  Qian Gong, Phillip Chamberlin, David Content, Jeffrey Kruk

- **HIGH PRECISION TECHNIQUE FOR STACKING FAR-INFRARED BANDPASS FILTERS**

  Ari Brown, Willie Merrell

- **PROCESS TO FORM DUPONT KAPTON HN POLYMIDE FILM INTO SPRINGS**

  John Moery

- **GENERAL MISSION ANALYSIS TOOL (GMAT) R2012A**

  Steven Hughes, Linda Jun, Wendy Shoan, Tuan Nguyen, Thomas Grubb, Joel Parker, Harvey Walden, Vladimir Lumelskly, Darrel Conway, Shawn Hoffman, John Bez

- **A NON-INTRUSIVE PRESSURE-LINE DRYER**

  Qiang Ji

- **NOVEL FAR ULTRAVIOLET PHOTODECTECTOR FOR OPEN SPACEAPPLICATIONS**

  Paul Shnitser, Victor Grubsky, Keith Shoemaker, Roman Ostroumov

- **SAMPLE ANALYSIS AT MARS INSTRUMENT SIMULATOR**

  Mehdi Benna, Tom Nolan

- **OPENLIS**

  Christa Peters-Lidard, Sujay Kumar, Yudong Tan, David Mocko, James Geiger, Luther Lighty, Randal Koster, Rolf Reichle, Susan Olden, Ben Zaitchik

- **MINIATURE TIME-OF-FLIGHT MASS SPECTROMETER (TOF-MS) WITH A WIRE RING REFLECTRON AND COMBINED DETECTOR BODY / ION GATE**

  Timothy Cornish, Scott Ecelberger

- **GMSEC API GENERIC JMS MIDDLEWARE WRAPPER**

  Robert Wiegand, Matthew Handy

- **BIAMOLED (BIOMETRIC INTEGRATED ACTIVE-MATRIX ORGANIC LIGHT-EMITTING DIODE) DISPLAY**

  Eleanya Onuma

- **SELF FOCUSED OPTICAL VORTEX FOR USE AS A TRACTOR BEAM**

  Demetrios Poulios, Paul Stysley, Richard Kay, Donald Coyle, Gregory Clarke

- **SCOTCH-TAPE MIRROR FOR HARD X-RAYS**

  Maxim Markevitch

- **CICERO CONFIGURATION MANAGEMENT SYSTEM - A GENERIC, CUSTOMIZABLE, WEB-BASED DATABASE APPLICATIONTO FACILITATE DOCUMENTATION CHANGE**

  David Robshaw, Martyn Noss

- **GREAT (GODDARD MISSION SERVICES EVOLUTION CENTER (GMSEC) REUSABLE EVENTS ANALYSIS TOOLKIT)**

  Matthew Handy, Robert Wiegand

- **GIOVANNI TABLET APP SUITE**

  Christopher Lynnes, Hannah Kerner

- **THUNDER WHEEL**

  Eleanya Onuma

- **PACKET TO ELECTRICAL GROUND SUPPORT EQUIPMENT (EGSE) INTERFACE CONVERTER, VERSION 4.0.**

  Thomas Pfarr

Patents Issued

- **SENSOR COMPLETE REQUIREMENTS ALGORITHM FOR AUTONOMOUS MOBILITY**

  Steven Curtis

- **OTOACOUSTIC PROTECTION IN BIOLOGICALLY-INSPIRED SYSTEMS**

  Michael Hinchey, Roy Sterritt

- **COMPACT PLANAR MICROWAVE BLOCKING FILTER**

  Edward Wollack, Kongpop U-yen

- **AERODYNAMICALLY STABILIZED INSTRUMENT PLATFORM FOR KITES AND TETHERED BLIMPS ("AEROPOD")**

  Ted Miles, Geoffrey Bland

- **HUGHES PARTICLE – SURFACE INTERACTION MODEL**

  David Hughes

- **OTOACOUSTIC PROTECTION IN BIOLOGICALLY-INSPIRED SYSTEMS**

  Michael Hinchey, Roy Sterritt

Patent Applications Filed

- **APPARATUSES AND METHODS TO ENABLE SUB-MHZ PRECISION IN FAST LASER FREQUENCY TUNING**

  Jeffrey Chen, Kenji Numanta, Stewart Wu, Guangning Yang

- **INTEGRATED GENOMIC AND PROTEOMIC INFORMATION SECURITY PROTOCOL**

  Harry Shaw, Brian Gosselin

- **DEVELOPMENT OF THE HILBERT-HUANG TRANSFORM REAL-TIME DATA PROCESSING SYSTEM WITH 2-D CAPABILITIES**

  Semion Kizhner

- **IMPLEMENTATION PLATFORM FOR NEW METHODOLOGY OF REDUCING SENSOR AND READOUT ELECTRONICS CIRCUITRY NOISE IN DIGITAL DOMAIN USING REFERENCE SPACE PIXELS**

  Semion Kizhner, Max Pinchinat, Thomas Flatley, Dominic Benford

- **A CRYPTOGRAPHIC APPROACH TO MICRORNA TARGET BINDING ANALYSIS**

  Harry Shaw

Integrated Design Center

[PARTNERSHIP *Agreements*

On May 14, 2012, a Space Act Agreement was signed between NASA Goddard Space Flight Center and the California Institute of Technology (Caltech) in Pasadena to support the continued operation of the Galaxy Evolution Explorer (GALEX) for three years. GALEX was operated as a NASA mission for about nine years, scouring the sky with its ultraviolet sensors and cataloguing galaxies over the vast expanse of space.

Under the agreement, Caltech will manage and operate the satellite, working with several international research groups to continue ultraviolet studies of the universe. Projects include cataloguing more galaxies across the entire sky; watching how stars and galaxies change over time; and making deep observations of the stars being surveyed for orbiting planets by NASA's Kepler mission.

—PHOTO PROVIDED BY THE INTEGRATED DESIGN CENTER (IDC)

Goddard Tech Transfer News [http://ipp.gsfc.nasa.gov]

Goddard *Tech Transfer News* is the quarterly magazine of the Innovative Partnerships Program Office (Code 504) at NASA's Goddard Space Flight Center. Also available online at: http://ipp.gsfc.nasa.gov. Send suggestions to Robert.S.Leonardi@nasa.gov.

www.nasa.gov

NP-2012-8-320-GSFC